Power from Poultry Litter

Regional-Scale Renewable Energy Plant

Terry Walmsley

Environmental Affairs Manager

Presentation at the:

Waste-to-Energy Workshop

For the Farm, Food Processing, & Wood Industries

Huntingburg, Indiana

December 11, 2006

Fibrowatt LLC

- **Fibrowatt has developed, permitted, financed, and is currently constructing the country's first poultry litter fueled power plant in Benson, Minnesota.**
- **Fibrowatt has operated in the U.S. since 2000 and is a subsidiary of Homeland Renewable Energy of Bedford, New Hampshire.**
- **Headquartered in Newtown, Pennsylvania (north of Philadelphia).**
- **Independent Power Producer – develop, finance, construct, and operate.**
- **Fibrowatt is currently developing projects in many U.S. States – primarily in the Southeast.**
- **The founders of Fibrowatt built the world's first three poultry litter fueled power plants in the U.K..**
  - Combusting 750,000 tons a year of biomass
  - Producing 65 MW of renewable energy
  - Selling the ash as a nutrient-rich fertilizer

Fibrowatt's Track Record

Over a decade of experience converting poultry litter to renewable energy

U.K. Operating Plants:

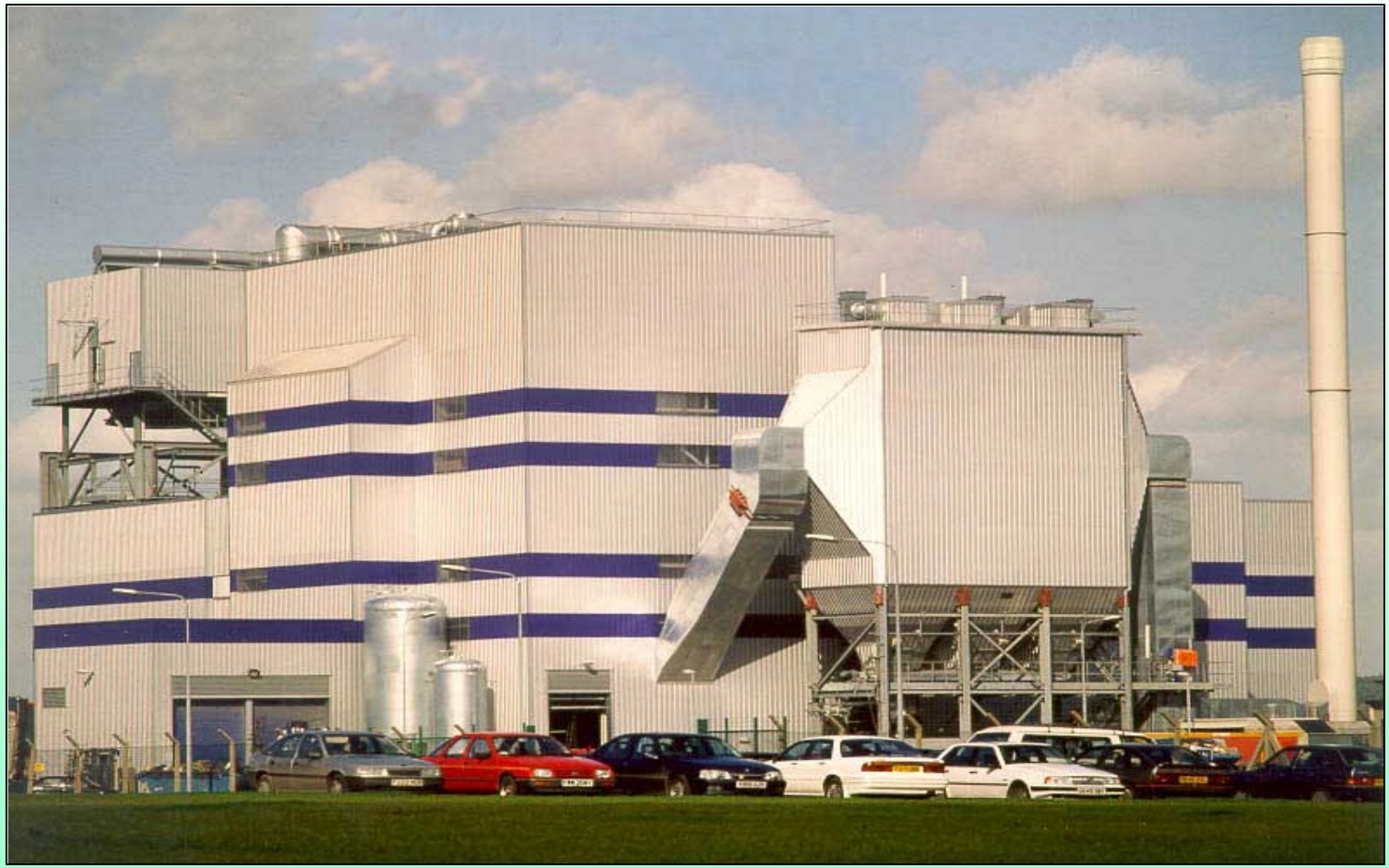
1. Eye Power Station

Commissioned 1992 **Design output 12.7 MW**

Burns 170,000 ton/yr. of poultry litter & other biomass

U.K. Operating Plants:

2. Glanford Power Station



Commissioned 1993 **Design output 13.5MW**

Currently burning meat & bone meal

U.K. Operating Plants:

3. Thetford Power Station

Commissioned 1998 **Design output 38.5MW**

Burns 500,000 ton/yr. of poultry litter & other biomass

U.S. Plant Construction:

1. Fibrominn Biomass Power Plant

Construction 2004-2007 **Design output 55MW**

Will combust over 700,000 ton/yr. of poultry litter & other biomass

Fibrominn Biomass Power Plant

Benson, Minnesota

- **Planned Start-up Date:** March-July 2007
- **Biomass Consumption:** ~700,000 tons/yr.
- **Expected Fuel Mix:** 90% Litter
  9% Sec. Biomass
  <1% Propane
- **Ash Fertilizer:** ~90,000 tons/yr.
- **Operation:** 24/7 (~90% annually)
- **Electric Generation:** 55 MW – peak
- **Boiler:** Spreader – Stoker

The Fibrowatt Solution

Helping the poultry industry with an alternative for poultry litter management

A Fibrowatt Project

- **Using the unique and proven Fibrowatt technology.**
- **Removing surplus poultry litter, with all its nutrients, from areas of concentrated poultry production.**
- **Recovering value from the nutrients by selling the ash fertilizer.**
- **Generating electricity from poultry litter and other "home-grown" fuels.**
- **Generating an important supply of renewable energy with resultant Greenhouse Gas / Global Climate Change benefits.**

The only proven large scale alternative to land application

The Fibrowatt Approach

Fibrowatt is an environmental service provider, not just a renewable energy producer.

Providing an environmentally sustainable long-term approach to litter management through energy generation.

How it Works – *at the farm*

- **We sign long-term supply agreements with poultry growers & other biomass suppliers.**
- **Poultry litter is removed from barns, working with Fibrowatt's fuel procurement managers.**
  - Fibrowatt assists in planning clean-out
- **Fibrowatt assumes responsibility for fuel transportation.**
  - Sensitivity to poultry industry biosecurity concerns

Poultry Farm

Covered Conveyor

Loading the Truck

Covered Transportation

How it Works – *at the plant*

- **Loads are weighed and tested upon arrival at the plant.**
- **Deliveries accepted and managed according to fuel quality (moisture content).**
- **Trucks tip only when fuel hall doors are closed.**
  - Maintains negative pressure
  - Odors cannot escape, since fuel hall air is drawn into the furnace
- **Poultry litter is stored in a fully enclosed building.**
- **Trucks are cleaned with a bio-disinfectant before returning to poultry farms.**

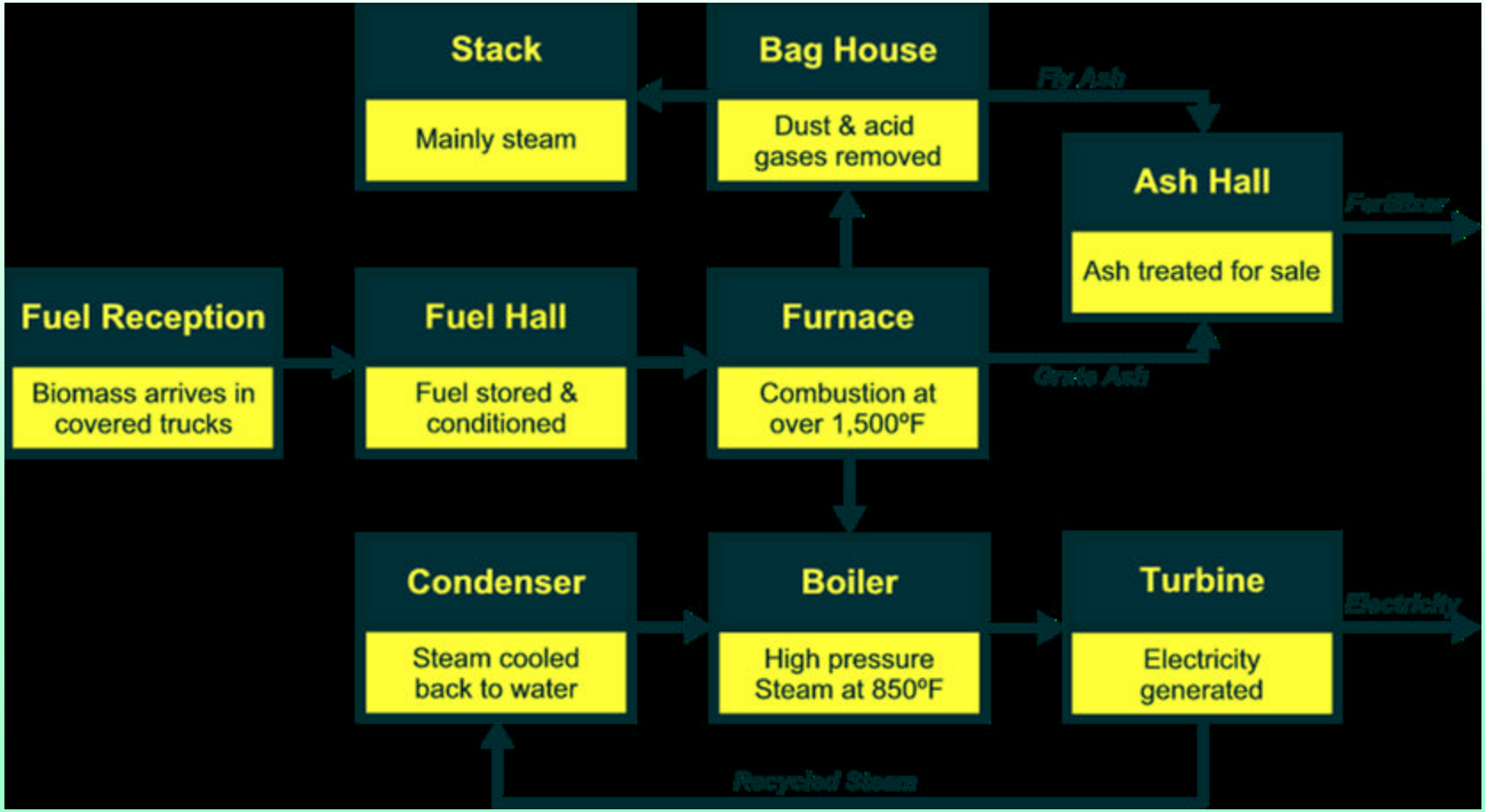
Truck on Scales

Fuel Delivery

Trucks Unloading

Truck Wash

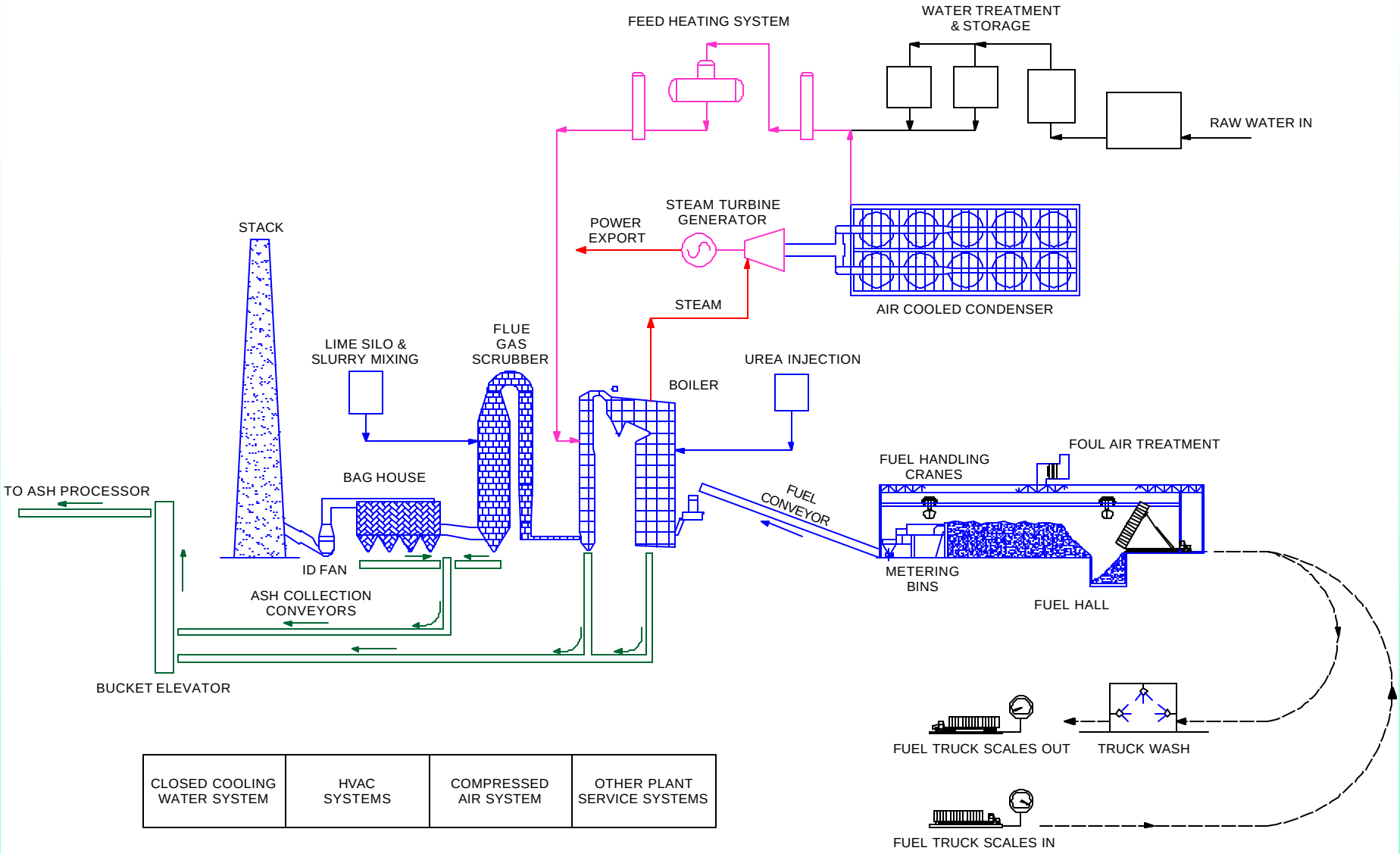
How it Works – *in the plant*



Challenges of Poultry Litter as a Biomass Fuel

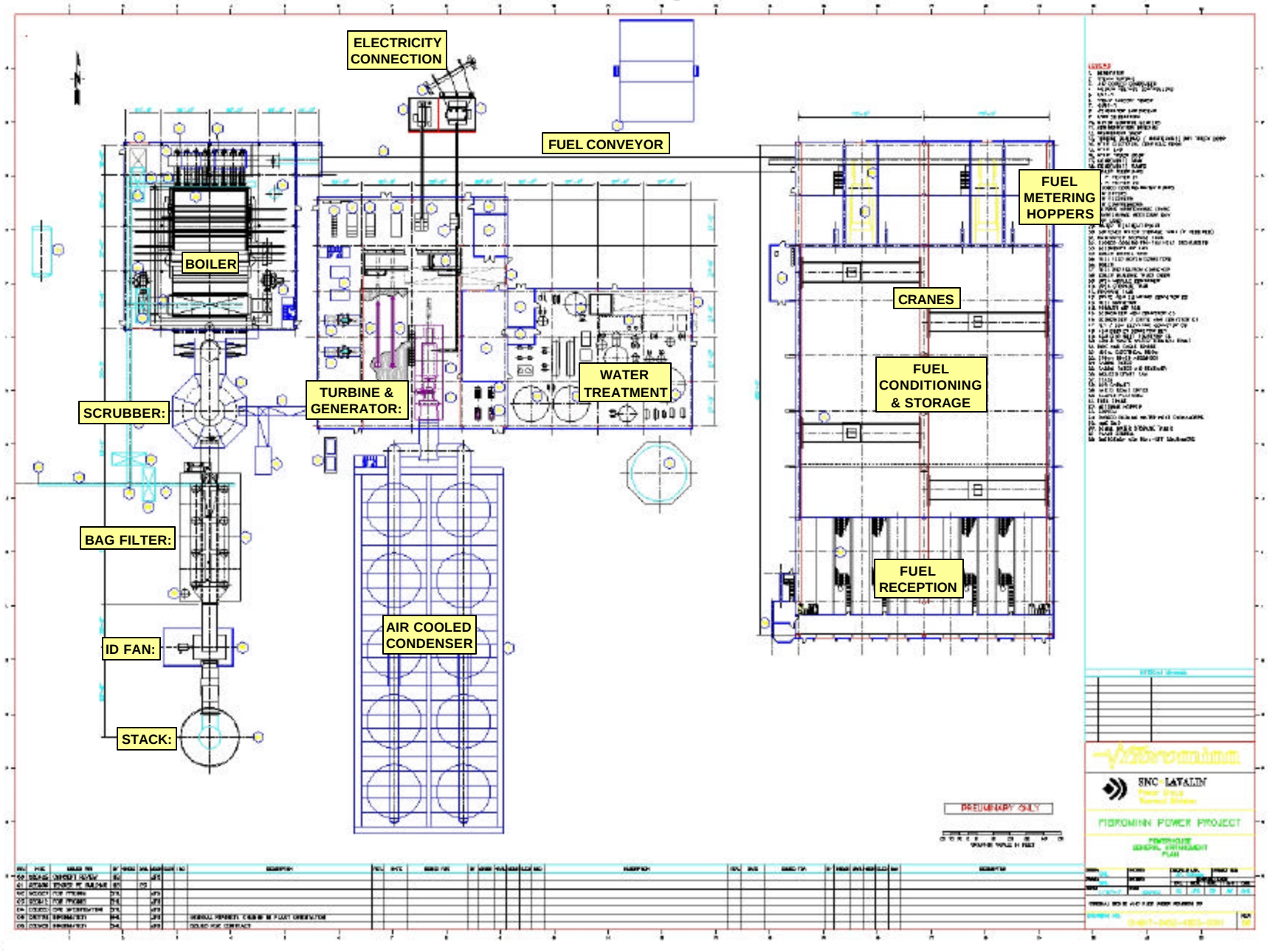
- **Variability of litter moisture content.**
- **High ash content.**
- **Ash constituents (high alkali metals – potassium and sodium).**
- **Combustion ash alkalinity.**
- **Fuel compression in transport and storage (hard to handle).**
- **Odor constituents.**
- **Sulfur and chlorine content.**
- **Biological activity (material is “alive”) requiring special handling.**

Plant Functional Diagram



CLOSED COOLING WATER SYSTEM	HVAC SYSTEMS	COMPRESSED AIR SYSTEM	OTHER PLANT SERVICE SYSTEMS

Fibrominn Plant Layout



Benefits of the Fibrowatt Solution

Benefits to Poultry Farmers

- **Reduces grower management responsibilities.**
  - Litter management is just a phone call away
  - A straightforward approach to demonstrating manure management
  - Reduces or eliminates recordkeeping associated with storage and application
  - Can reduce the need for manure and soil testing
  - Eases permitting responsibilities
  - Reductions in application equipment and service costs
- **Helps with community standing.**
  - A means to minimize odor impacts (stockpiling & spreading)
  - Supports community economic growth and vitality
  - Demonstrates continued efforts to improve environmental stewardship

The Fibrowatt solution allows growers to concentrate on their core business – economic and efficient poultry rearing

Benefits to Poultry Industry

- **Provides long-term alternative use for litter.**
  - Value of poultry litter guaranteed over a long period of time
  - Fibrowatt will commit to taking your poultry litter
  - Provides a sustainable alternative to land spreading
  - Provides insurance against future regulatory risk
  - Helps support regional expansion of the poultry industry
- **Can enhance bio-security and bird health.**
  - Year round solution, not tied to field application schedule
  - Opportunity for more frequent litter clean-out
  - Ability to take advantage of year round availability for bedding cost reductions
  - Improves & expedites clean-out processes
  - Improves avian disease control – demonstrated end-point for litter

Helps sustain the future of the poultry industry in major poultry production regions

Benefits to Local Economy

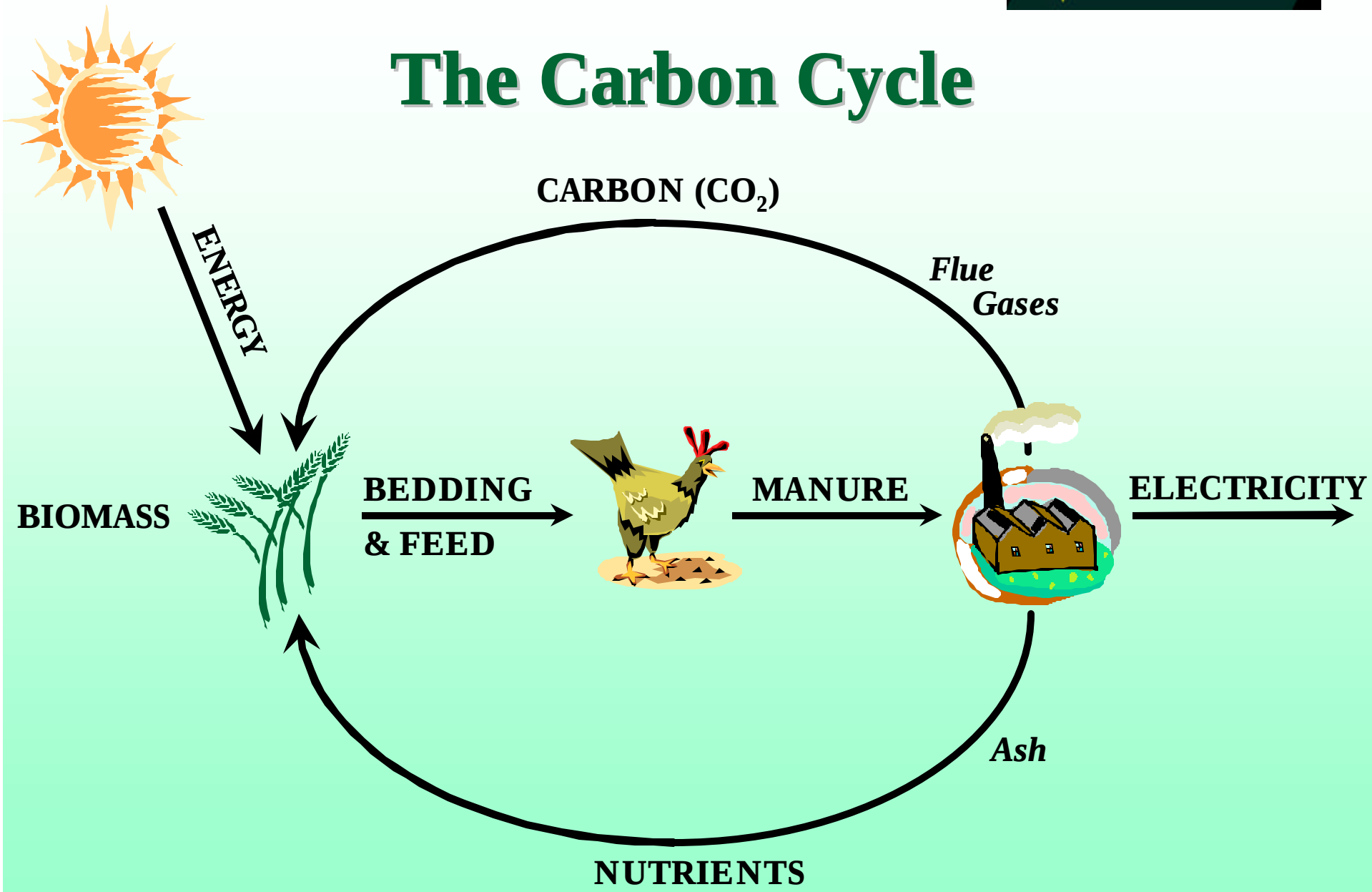
- **Local Economy.**
  - Up to 300 construction jobs (2-3 yr period)
  - 90-100 permanent full-time jobs (30 on site, >60 in transport)
  - >100 part-time indirect jobs (support services)
  - $8-10 million injected into local economy each year
  - $150 million investment in capital and infrastructure
  - Can justify and support local infrastructure upgrades
- **Local farm & forestry industries.**
  - Promotes sustainable poultry industry – therefore local crop markets
  - Provides additional markets for crop residues and forestry by-products
  - Improves transportation equipment utilization

A Fibrowatt Plant can be an important component in the sustainability of a rural community and agriculturally-based economy

Benefits to Environment

- **Reduces need to stockpile & land spread manure.**
  - Can reduce water impacts associated with excess nutrient application
  - Reduces local odor impacts (release of volatile organics and ammonia)
- **Ability to export the nutrients in the ash.**
  - Can reduce need for commercial fertilizer to regional areas where litter can not be economically utilized
  - Ash is only 10% of the weight of the original biomass – opening up new regional, national, and international markets for litter nutrients
- **Generation of renewable energy.**
  - Using sustainable, local fuel sources
  - Displacing fossil-fuel emissions (ex. NO_x, SO_2, CO, Particulate)
- **Reduction in greenhouse gases.**
  - Eliminates excess methane & nitrous oxide production from land application
  - Displaces fossil-fueled greenhouse-gas-producing generation (no new CO_2)

The Carbon Cycle



Benefits to Nutrient Balance

- **Nitrogen-free fertilizer (removes problems with N & P imbalance).**
- **Contains all the nutrients that were in the poultry litter, except nitrogen plus:**
  - significant levels of secondary nutrients (e.g., sulfur) and
  - micronutrients (e.g., iron, zinc).
- **Approximately 10% by weight of the incoming litter (spread out nutrient loading to other regional areas).**
- **Field application rates – 25 times less than litter (better agronomic application capabilities).**
- **Economically able to be transported to distant markets.**
- **Ash successfully marketed in UK by Fibrowatt.**

UK Ash Fertilizer Analysis

Primary:	**Phosphorus**	**P_2O_5**	**22%**
	Potassium	**K_2O**	**12%**
Secondary:	Calcium	CaO	21%
	Sulphur	SO_3	8%
	Magnesium	MgO	6%
	Sodium	NA_2O	2%
Trace Elements:	Iron	Fe	4,000 ppm
	Zinc	Zn	3,000 ppm
	Manganese	Mn	2,500 ppm
	Copper	Cu	500 ppm
	Boron	B	150 ppm
	Molybdenum	Mo	100 ppm
	Cobalt	Co	20 ppm
Micro-nutrients:	Iodine	I	5.5 ppm
	Selenium	Se	4.4 ppm
Liming Value	(As % of CaO)		14%
Solubility	In 2% citric acid		80-95%

Discussion
and
Q & A